

From the INTERNATIONAL BUREAU

**PCT**

NOTIFICATION OF TRANSMITTAL  
OF COPIES OF TRANSLATION  
OF THE INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY  
(CHAPTER I OR CHAPTER II  
OF THE PATENT COOPERATION TREATY)  
(PCT Rules 44bis.3(c) and 72.2)

To:

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06.12.20  
SOEI

Date of mailing (day/month/year)  
07 December 2006 (07.12.2006)

Applicant's or agent's file reference  
FP04-0486-00

**IMPORTANT NOTIFICATION**

International application No.  
PCT/JP2005/003751

International filing date (day/month/year)  
04 March 2005 (04.03.2005)

Applicant

HAMAMATSU PHOTONICS K.K. et al

**1. Transmittal of the translation to the applicant.**

The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter I).



The International Bureau transmits herewith a copy of the English translation of the international preliminary report on patentability (Chapter II).

**2. Transmittal of the copy of the translation to the designated or elected Offices.**

The International Bureau notifies the applicant that copies of that translation have been transmitted to the following designated or elected Offices requiring such translation:

None

The following designated or elected Offices, having waived the requirement for such a transmittal at this time, will receive copies of that translation from the International Bureau only upon their request:

AE, AG, AL, AM, AP, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EA, EC, EE, EG, EP, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OA, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW

**3. Reminder regarding translation into (one of) the official language(s) of the elected Office(s).**

The applicant is reminded that, where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability (Chapter II).

It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned within the applicable time limit (Rule 74.1). See Volume II of the PCT Applicant's Guide for further details.



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# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference FP04-0486-00	<b>FOR FURTHER ACTION</b>	See item 4 below
International application No. PCT/JP2005/003751	International filing date ( <i>day/month/year</i> ) 04 March 2005 (04.03.2005)	Priority date ( <i>day/month/year</i> ) 04 March 2004 (04.03.2004)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant HAMAMATSU PHOTONICS K.K.		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- |                                     |              |   |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the report   |
| <input type="checkbox"/>            | Box No. II   | Priority  |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention  |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited   |
| <input checked="" type="checkbox"/> | Box No. VII  | Certain defects in the international application  |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application   |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No. +41 22 338 82 70	Date of issuance of this report 29 November 2006 (29.11.2006)  Authorized officer  <div style="text-align: center; font-weight: bold; font-size: 1.2em;">Masashi Honda</div>  e-mail: pt08@wipo.int
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# PATENT COOPERATION TREATY

TRANSLATION

From the  
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing  
(day/month/year)

Applicant's or agent's file reference

**FP04-0486-00**

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.

**PCT/JP2005/003751**

International filing date (day/month/year)

**04.03.2005**

Priority date (day/month/year)

**04.03.2004**

International Patent Classification (IPC) or both national classification and IPC

Applicant

**HAMAMATSU PHOTONICS K.K.**

1. This opinion contains indications relating to the following items:

- |                                     |              |  |
|-------------------------------------|--------------|--|
| <input checked="" type="checkbox"/> | Box No. I    | Basis of the opinion   |
| <input type="checkbox"/>            | Box No. II   | Priority   |
| <input type="checkbox"/>            | Box No. III  | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability   |
| <input type="checkbox"/>            | Box No. IV   | Lack of unity of invention   |
| <input checked="" type="checkbox"/> | Box No. V    | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/>            | Box No. VI   | Certain documents cited  |
| <input checked="" type="checkbox"/> | Box No. VII  | Certain defects in the international application   |
| <input type="checkbox"/>            | Box No. VIII | Certain observations on the international application  |

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/JP

Authorized officer

Facsimile No.

Telephone No.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2005/003751

Box No. I      Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material  
☐ in written format  
☐ in computer readable form
  - c. time of filing/furnishing  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/JP2005/003751

**Box No. V** Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

**1. Statement**

Novelty (N)	Claims	3-12	YES
	Claims	1, 2	NO
Inventive step (IS)	Claims		YES
	Claims	1-12	NO
Industrial applicability (IA)	Claims	1-12	YES
	Claims		NO

**2. Citations and explanations:**

Document 1: JP, 05-167197, A  
Document 2: JP, 10-41582, A  
Document 3: JP, 10-284805, A  
Document 4: WO, 2000-048277, A1

Document 1 describes a semiconductor device in which an n-type clad layer, an active layer and a p-type clad layer are sequentially formed on a substrate, wherein (1) the p-type clad layer has a ridge portion forming a refractive index waveguide in the active layer, and (2) the side face of the ridge portion crosses at an angle equal to or smaller than the complementary angle of the total reflection critical angle with respect to the direction of the normals on the end faces.

Therefore, the subject matters of claims 1 and 2 do not appear to be novel or to involve an inventive step in view of the invention described in document 1.

Furthermore, (1) installing a wavelength selecting means such as a diffraction grating, a multilayered film of a derivative and a wavelength selecting element, in the laser element, and (2) arraying the laser element are respectively well-known. So, a person skilled in the art could have easily conceived of providing the wavelength selecting means, or constituting the subject matters of claims 8-12 by arraying, in the semiconductor device in the invention described in document 1.

Therefore, the subject matters of claims 8-12 do not appear to involve an inventive step in view of the invention described in document 1.

The subject matters of claims 1-3, 5 and 8-12 do not appear to involve an inventive step in view of the inventions described in documents 2 and 3.

Document 2 describes a constitution in which (1) an axis of the light waveguide and the direction of the normals are formed to cross at a deviation angle  $\theta$  to improve the characteristics of a single mode, and (2) the reflection of the end face in the first mode is totally controlled and the oscillation in the primary mode becomes dominant in the vicinity of a deviation angle  $\theta$  of  $0.8^\circ$ . Furthermore, a refractive index-type waveguide semiconductor laser array in which the clad layer is provided with the ridge part was a well-known technique when the present application was filed (for example, see, Figs. 3 and 4 in document 3). In addition, installing a wavelength selecting means such as a diffraction grating, a multilayered film of a derivative and a wavelength selecting element in the laser element is also a well-known technique.

Therefore, a person skilled in the art could have easily conceived of applying the waveguide structure wherein the side face crosses at a deviation angle of  $\theta$  in the refractive index-type waveguide semiconductor laser array, as described in document 2, which was a well-known technique when the present application was filed, and arrived at the constitutions of the subject matters of claims 1-3, 5 and 8-12.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2005/003751

Box No. V

Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

The subject matters of claims 4, 6 and 7 do not appear to involve an inventive step in view of the inventions described in documents 2-4.

Document 4 describes that the reflection efficiency can be maximized by setting the angle such that the axis of the resonator and the end face is composed in the vicinity of the critical angle.

Therefore, concerning document 2, a person skilled in the art could have easily conceived of setting the angle such that the axis of the resonator and the end face is composed of the critical angle as in the description of document 4, and arrived at the constitutions of the subject matters of claims 4, 6 and 7.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2005/003751

Box No. VII      Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

The description of “straight” in claims 4 and 12 is an error for “orthogonal”.